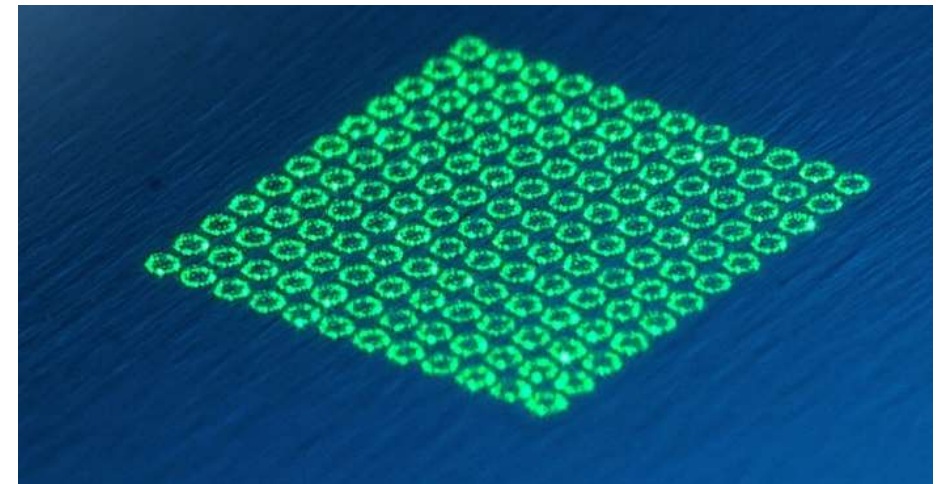

Perspectives and Challenges for High Power Femtosecond Laser Processing

Arnold Gillner

Martin Reininghaus

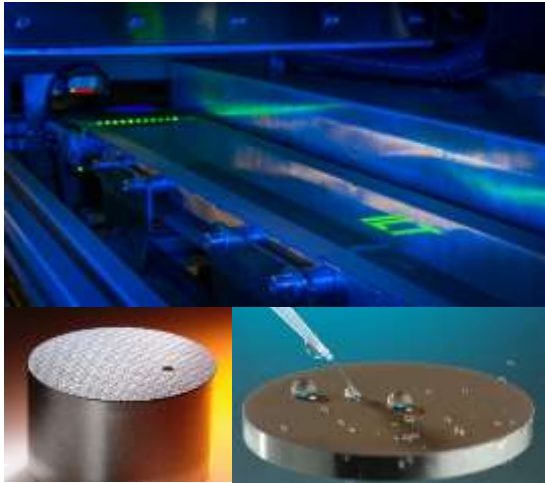
Fraunhofer Institute for Laser Technology



© Fraunhofer ILT

Ultrafast laser processing: Industrial Applications

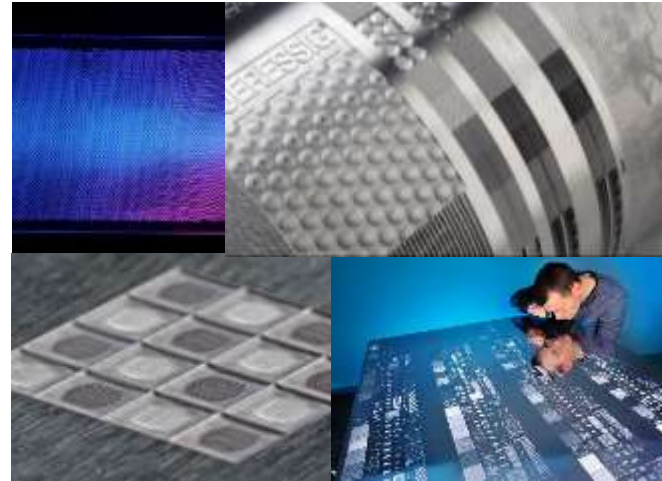
Functional surfaces & Thin film processing



Source: ILT

- Battery Technology
- Self cleaning surfaces
- Antibacterial surfaces
- Absorption enhancement
- Friction reduction / bearing

Surface structuring & Deep engraving



Source: ILT

- Tools and molds
- Design structures
- Printing/Printed electronics
- Security features
- Micro embossing

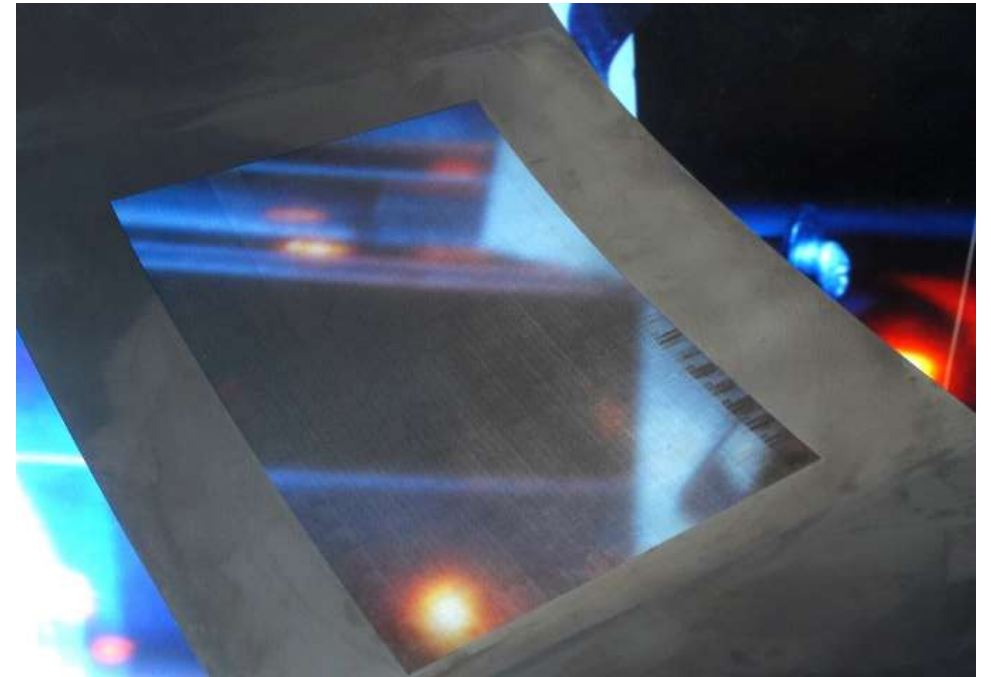
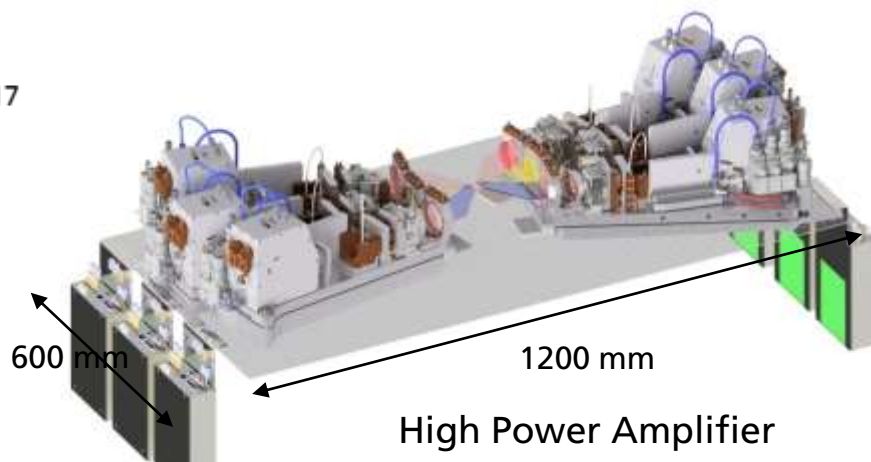
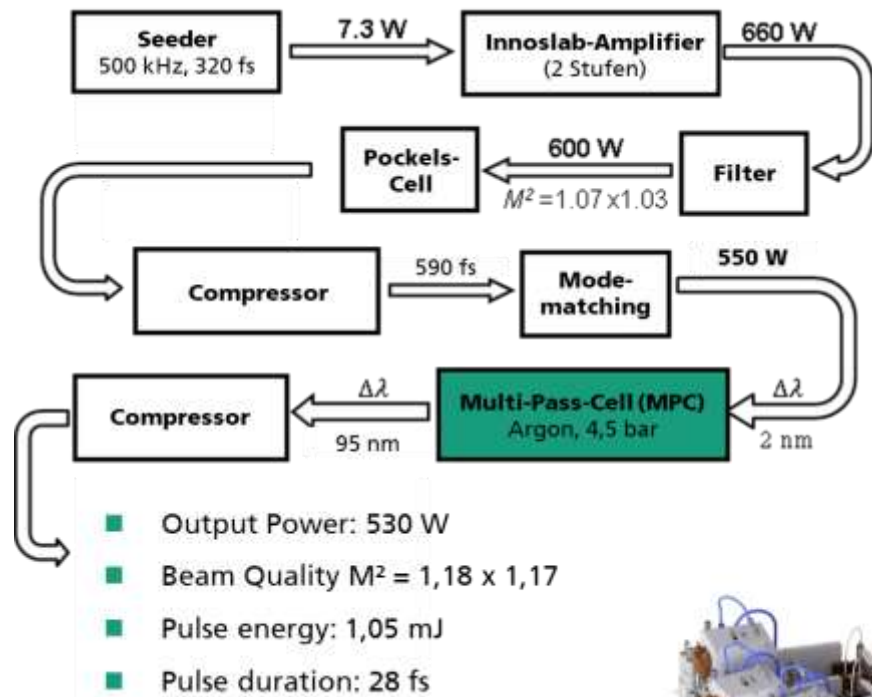
Drilling & Cutting



Source: ILT

- Electronics / Vias
- Micro-filter
- CFRP processing
- Ceramics processing
- Micro-mechanics

Ultrafast Lasers and Laser Processes at Fraunhofer ILT



Nano-Filter

- > 1 kW Laser Power
- New Wavelengths
- Pulse compression
- Extreme Intensities

- Highly accurate Processing
- Nonlinear Materials Interaction
- Large Scale Processing

Laser Development

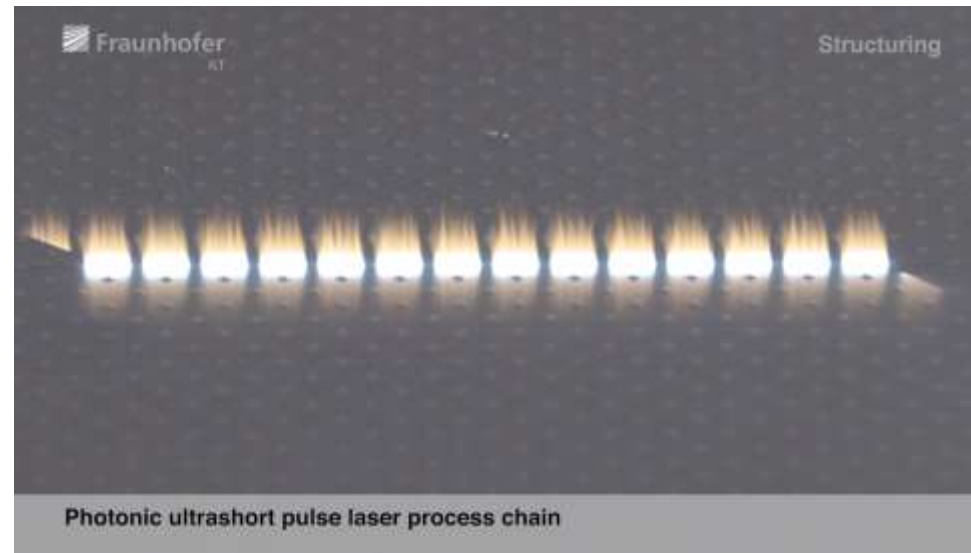
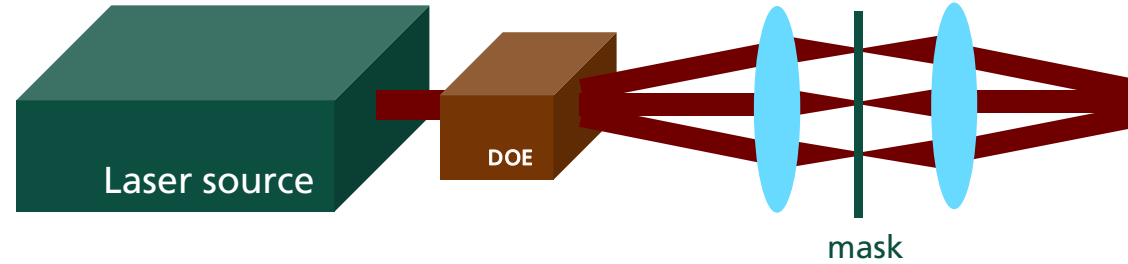
Laser Process Development

Power scaling: Pulse Energy - Multi-beam processing

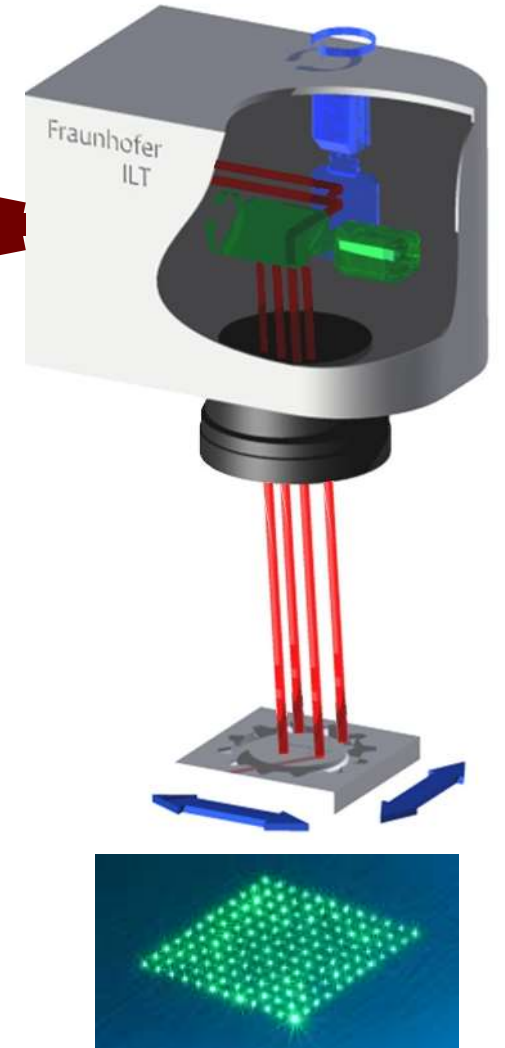


Optics for parallel processing

Multi beam splitting by diffractive optics



Surface structuring of injection molding tool



Summary

Future of ultrafast lasers for machining applications

- Higher average power
- Pulse duration < 1 ps
- Flexible pulse control

System technology

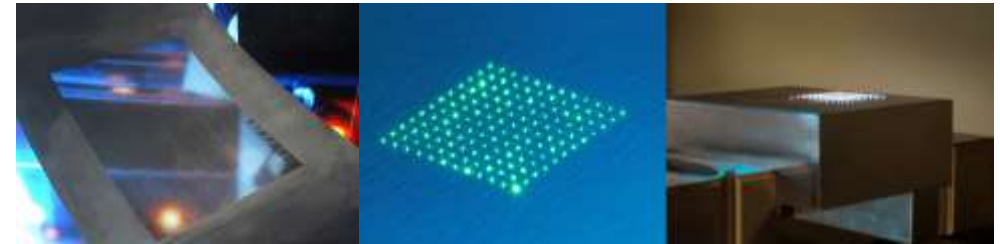
- Bottleneck for the moment
- Parallelization
- Fast beam deflection
- Beam shaping

Future applications

- Micro precision on large areas
- Macro processing with ultrafast lasers
- Second Source for Imaging applications

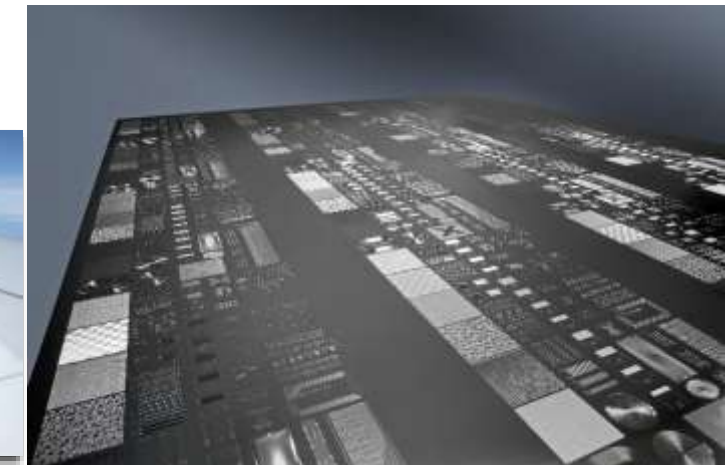
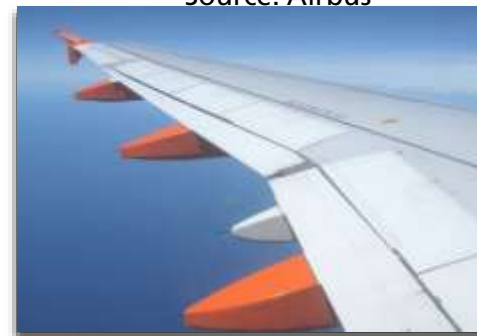


Source: GFMS / Working range: 4m x 3m x 1.5m



Source:: ILT

Source: Airbus



Source: Schepers / MultiSurf

6TH UKP-WORKSHOP: ULTRAFAST LASER TECHNOLOGY APRIL 20–21, 2021

SAVE THE DATE

